



General

Guideline Title

The utility of positron emission tomography in epilepsy.

Bibliographic Source(s)

Burneo JG, Poon R, Kellett S, Houle S, Snead OC. The utility of positron emission tomography in epilepsy. Toronto (ON): Cancer Care Ontario (CCO); 2015 Jan 29. 30 p. (PET recommendation report; no. 13). [51 references]

Guideline Status

This is the current release of the guideline.

The PET Recommendation Report, initially the full original Guideline, over time will expand to contain new information emerging from reviewing and updating activities.

Please visit the [Cancer Care Ontario Web site](#) for details on any new evidence that has emerged and implications to the guidelines.

This guideline meets NGC's 2013 (revised) inclusion criteria.

Recommendations

Major Recommendations

Recommendations

1. ^{18}F -fluorodeoxyglucose (^{18}F -FDG) positron emission tomography (PET) is recommended for the presurgical evaluation of adult and pediatric patients with medically intractable focal or partial epilepsy in the setting of a comprehensive epilepsy surgery program within a Regional Epilepsy Surgery Center of Excellence.
2. Due to insufficient evidence, a recommendation cannot be made for or against the use of ^{18}F -FDG PET in the detection of cortical malformations in patients with intractable infantile spasms when magnetic resonance imaging (MRI) or computed tomography (CT) fails to show structural abnormalities.
3. Due to insufficient evidence, a recommendation cannot be made for or against the use of ^{18}F -FDG PET/MRI coregistration in the presurgical evaluation of patients with medically intractable epilepsy.

Clinical Algorithm(s)

None provided

Scope

Disease/Condition(s)

Epilepsy

Guideline Category

Diagnosis

Evaluation

Clinical Specialty

Neurological Surgery

Neurology

Intended Users

Other

Patients

Physicians

Guideline Objective(s)

- To guide the Ontario Positron Emission Tomography (PET) Steering Committee in their decision making with respect to the development of indications for the use of PET in epilepsy
- To inform clinicians and patients who are seeking information about PET as a presurgical tool in epilepsy

Target Population

Adult and pediatric patients with medically intractable epilepsy being considered for surgery

Interventions and Practices Considered

¹⁸F-fluorodeoxyglucose (¹⁸F-FDG) positron emission tomography (PET) for presurgical evaluation of adult and pediatric patients with medically intractable focal or partial epilepsy

Note: The following interventions were considered but there was insufficient evidence to make a recommendation for or against:

¹⁸F-FDG PET in the detection of cortical malformations in patients with intractable infantile spasms when magnetic resonance imaging (MRI) or computed tomography (CT) fail to show structural abnormalities.

¹⁸F-FDG PET/MRI coregistration in the presurgical evaluation of patients with medically intractable epilepsy.

Major Outcomes Considered

- Diagnostic accuracy (sensitivity, specificity, positive predictive value [PPV], negative predictive value [NPV])
- Surgical management impact
- Patient outcome impact

Methodology

Methods Used to Collect/Select the Evidence

Hand-searches of Published Literature (Primary Sources)

Hand-searches of Published Literature (Secondary Sources)

Searches of Electronic Databases

Description of Methods Used to Collect/Select the Evidence

Literature Search Strategy

The literature was searched using MEDLINE (1946 to September Week 4 2013) and EMBASE (1974 to 2013 Week 29) databases in OVID. The search strategy combined disease-specific terms (exp epilepsy/ or epilep\$.ti,ab.) with intervention-specific terms (exp tomography, emission computed/ or pet or positron emission tomograph\$ or positron-emission),ti, ab.). See Appendix 1 in the original guideline document for the search strategy.

In addition, annual meetings of the American Epilepsy Society (https://www.aesnet.org/meetings_events/annual_meeting_abstracts) were searched up to September 2013 for other relevant abstracts. Likewise, the

- Canadian Medical Association Infobase (<https://www.cma.ca/En/Pages/clinical-practice-guidelines.aspx>)
- National Guideline Clearinghouse (<http://www.guideline.gov/>)
- And Cochrane Database of Systematic Reviews (<http://www.thecochranelibrary.com/view/0/index.html>)

were searched up to September 2013 for existing evidence-based practice guidelines. Relevant articles and abstracts were selected and reviewed by two reviewers, and the reference lists from these were searched for additional studies, as were the reference lists from relevant review articles.

Study Selection Criteria

Inclusion Criteria

Fully published reports or abstracts that met the following criteria were selected for inclusion:

- Systematic reviews, randomized controlled trials (RCTs), and prospective or retrospective studies that evaluated the use of ^{18}F -fluorodeoxyglucose (^{18}F -FDG) positron emission tomography (PET) in medically intractable epilepsy
- Studies that included ≥ 12 patients of any age
- Reported on at least one of the following outcomes: diagnostic accuracy (sensitivity, specificity, positive predictive value [PPV], negative predictive value [NPV]), surgical management impact, or patient outcome impact
- Studies that used a suitable reference standard (intracranial electroencephalogram (EEG), surgical eligibility, good surgical outcome [Engel class I, II, or III]) when appropriate

Exclusion Criteria

- Studies of non- ^{18}F -FDG PET
- Non-systematic reviews, letters, editorials, individual case reports, historical articles, or commentaries
- Reports published in a language other than English

Literature Search Results

No existing systematic reviews or evidence-based guidelines were found that specifically evaluated the use of ^{18}F -FDG PET against a suitable reference standard. In addition, there were no RCTs comparing the diagnostic accuracy and clinical utility of ^{18}F -FDG PET with intracranial electroencephalogram (EEG). However, 36 retrospective studies and three prospective studies were identified to be relevant to this recommendation report (see Figure 1 in the original guideline document). Six of these studies were reported solely in abstract form, while two studies had both the full publication and the abstract. The eligible studies were conducted in various contexts but the Working Group believed the outcomes valued in this report would be relevant to the Regional Epilepsy Surgery Centres of Excellence context.

Number of Source Documents

39 studies were included in the qualitative synthesis (36 retrospective studies and three prospective studies).

See Figure 1 in the original guideline document for a literature flow diagram.

Methods Used to Assess the Quality and Strength of the Evidence

Expert Consensus

Rating Scheme for the Strength of the Evidence

Not applicable

Methods Used to Analyze the Evidence

Systematic Review with Evidence Tables

Description of the Methods Used to Analyze the Evidence

Synthesizing the Evidence

Due to the heterogeneity of the studies in the patient population, study design, outcome measurements, and methods of positron emission tomography (PET) interpretation, the results of the studies included in the systematic review could not be pooled. An assessment of study quality was performed for all fully published reports by one methodologist.

Study Design and Quality

For the fully published reports, study quality was assessed using the Quality Assessment of Diagnostic Accuracy Studies (QUADAS-2) tool (see Appendix II in the original guideline document). Abstracts were not assessed due to limited reporting of study information. The overall quality varied among the studies but the large majority were judged to have low risk of bias. The most common concern was the influence of PET results on the interpretation of the reference standard. That is, localization with intracranial electroencephalogram (EEG), decision to perform surgery, and classification of surgical outcomes were often not blinded to PET findings. Furthermore, some studies excluded patients with magnetic resonance imaging (MRI) abnormalities (i.e., structural lesions), incomplete tests or short follow-up, lost to follow up, or a definite extratemporal seizure origin.

Refer to the "Results" section in the original guideline document for further information concerning the analysis of the evidence.

Methods Used to Formulate the Recommendations

Expert Consensus

Description of Methods Used to Formulate the Recommendations

This recommendation report, produced by the Program in Evidence-based Care (PEBC) and the Ontario Positron Emission Tomography (PET)

Steering Committee of Cancer Care Ontario, was developed through a systematic review of the available evidence. The body of evidence, which forms the basis of the recommendations, was reviewed by two clinical experts in the epilepsy field, two methodologists, and one member of the PET Steering Committee (imaging expert in mental illness and addictions).

Rating Scheme for the Strength of the Recommendations

Not applicable

Cost Analysis

A formal cost analysis was not performed and published cost analyses were not reviewed.

Method of Guideline Validation

Not stated

Description of Method of Guideline Validation

Not applicable

Evidence Supporting the Recommendations

Type of Evidence Supporting the Recommendations

The recommendations are supported by prospective and retrospective studies.

Benefits/Harms of Implementing the Guideline Recommendations

Potential Benefits

The potential benefit of positron emission tomography (PET) in the presurgical evaluation of patients with intractable epilepsy lies in its ability to provide data for localizing the seizure focus and to determine resectability. The evidence from the review proposes that PET is able to provide complementary information that can guide decision making toward successful surgery.

Potential Harms

False negative results of positron emission tomography (PET)

Qualifying Statements

Qualifying Statements

- Care has been taken in the preparation of the information contained in this report. Nonetheless, any person seeking to apply or consult the report is expected to use independent medical judgment in the context of individual clinical circumstances or seek out the supervision of a qualified clinician. Cancer Care Ontario makes no representation or guarantees of any kind whatsoever regarding the report content or use or application and disclaims any responsibility for its application or use in any way.

- For localizing epileptic foci or guiding intracranial electrode placement as part of the presurgical evaluation in a Regional Epilepsy Surgery Center of Excellence, patients with temporal lobe epilepsy may benefit more from positron emission tomography (PET) than patients with extratemporal lobe epilepsy.
- The evidence is suggestive that localization is greater when PET is assessed using statistical parametric mapping (SPM) and this method may be superior to visual interpretation for particular types of epilepsy. However, defining the exact group of patients for whom PET is likely to provide enhanced localization information based on SPM is beyond the scope of this report.
- Patients with intractable infantile spasms exhibiting focal metabolic abnormality on PET could be considered for surgery, provided that epileptogenicity of focal malformation is confirmed electrographically during the presurgical evaluation in a Regional Epilepsy Surgery Centre of Excellence. Surgery would not be considered based solely upon a focal area of hypometabolism on PET without other corroborating data.

Implementation of the Guideline

Description of Implementation Strategy

An implementation strategy was not provided.

Implementation Tools

Quick Reference Guides/Physician Guides

For information about availability, see the *Availability of Companion Documents* and *Patient Resources* fields below.

Institute of Medicine (IOM) National Healthcare Quality Report Categories

IOM Care Need

Getting Better

Living with Illness

IOM Domain

Effectiveness

Identifying Information and Availability

Bibliographic Source(s)

Burneo JG, Poon R, Kellett S, Houle S, Snead OC. The utility of positron emission tomography in epilepsy. Toronto (ON): Cancer Care Ontario (CCO); 2015 Jan 29. 30 p. (PET recommendation report; no. 13). [51 references]

Adaptation

Not applicable: The guideline was not adapted from another source.

Date Released

2015 Jan 29

Guideline Developer(s)

Program in Evidence-based Care - State/Local Government Agency [Non-U.S.]

Guideline Developer Comment

The Program in Evidence-based Care (PEBC) is a Province of Ontario initiative sponsored by Cancer Care Ontario and the Ontario Ministry of Health and Long-Term Care.

Source(s) of Funding

The Program in Evidence-based Care (PEBC) is a provincial initiative of Cancer Care Ontario supported by the Ontario Ministry of Health and Long-Term Care. All work produced by the PEBC is editorially independent from the Ontario Ministry of Health and Long-Term Care.

Guideline Committee

Utility of Positron Emission Tomography in Epilepsy Working Group

Composition of Group That Authored the Guideline

Authors: J.G. Burneo, R. Poon, S. Kellett, S. Houle, O.C. Snead

Financial Disclosures/Conflicts of Interest

The authors and reviewers reported that they had no conflicts of interest.

Guideline Status

This is the current release of the guideline.

The PET Recommendation Report, initially the full original Guideline, over time will expand to contain new information emerging from reviewing and updating activities.

Please visit the [Cancer Care Ontario Web site](#) for details on any new evidence that has emerged and implications to the guidelines.

This guideline meets NGC's 2013 (revised) inclusion criteria.

Guideline Availability

Electronic copies: Available from the [Cancer Care Ontario Web site](#) .

Availability of Companion Documents

The following are available:

- The utility of positron emission tomography in epilepsy. Summary. Toronto (ON): Cancer Care Ontario; 2015 Jan 29. 3 p. Electronic copies: Available from the [Cancer Care Ontario \(CCO\) Web site](#) .
- Program in Evidence-based Care handbook. Toronto (ON): Cancer Care Ontario (CCO); 2012. 14 p. Electronic copies: Available from the [CCO Web site](#) .

Patient Resources

None available

NGC Status

This NGC summary was completed by ECRI Institute on March 20, 2015.

Copyright Statement

This NGC summary is based on the original guideline, which is subject to the guideline developer's copyright restrictions. Please refer to the [Copyright and Disclaimer Statements](#) posted at the Program in Evidence-based Care section of the Cancer Care Ontario Web site.

Disclaimer

NGC Disclaimer

The National Guideline Clearinghouse^{â„¢} (NGC) does not develop, produce, approve, or endorse the guidelines represented on this site.

All guidelines summarized by NGC and hosted on our site are produced under the auspices of medical specialty societies, relevant professional associations, public or private organizations, other government agencies, health care organizations or plans, and similar entities.

Guidelines represented on the NGC Web site are submitted by guideline developers, and are screened solely to determine that they meet the NGC Inclusion Criteria which may be found at <http://www.guideline.gov/about/inclusion-criteria.aspx>.

NGC, AHRQ, and its contractor ECRI Institute make no warranties concerning the content or clinical efficacy or effectiveness of the clinical practice guidelines and related materials represented on this site. Moreover, the views and opinions of developers or authors of guidelines represented on this site do not necessarily state or reflect those of NGC, AHRQ, or its contractor ECRI Institute, and inclusion or hosting of guidelines in NGC may not be used for advertising or commercial endorsement purposes.

Readers with questions regarding guideline content are directed to contact the guideline developer.